

Name \_\_\_\_\_

Period \_\_\_\_\_

## Periodic Trends

Go to the class website and open Periodic Trends Data, located under Unit III—Atomic Theory, Nuclear Chemistry, & Bonding.

For each of the following periodic properties:

- Atomic radii
- Ionic radii
- Ionization Energy
- Electron Affinity
- Electronegativity

- 1) Create a graph of each property on the y-axis and the atomic number on the x-axis. Sketch the graph in the space provided below.
- 2) Answer the questions associated with each property.

*Atomic radii*

- 1) Define atomic radius:
- 2) Graph of atomic radii versus atomic number.

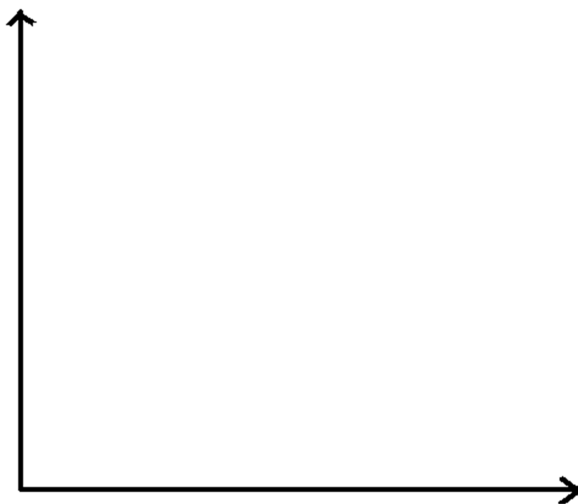


- 3) What trend do you observe in the graph?

- 4) Looking at the atomic numbers how does the trend you observe in question #3 apply the elements on the periodic table?

*Ionic radii*

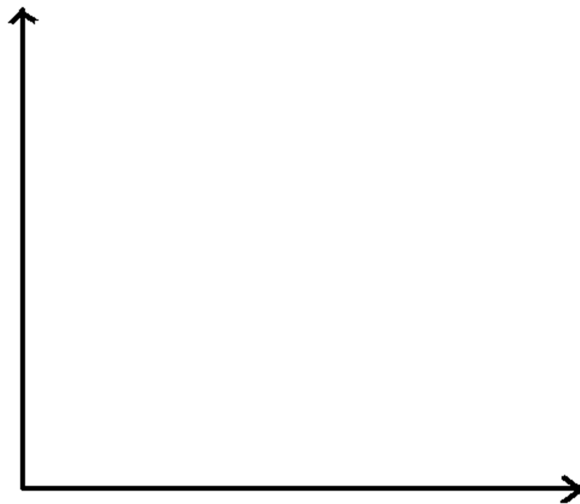
- 1) Define ionic radius:
- 2) Graph of ionic radii versus atomic number:



- 3) What trend do you observe in the graph?
- 4) Looking at the atomic numbers how does the trend you observe in question #3 apply the elements on the periodic table?
- 5) Compare the trends of atomic radii to ionic radii.
- 6) Choose three different elements. How is the ionic radii different from the atomic radii?

### *Ionization Energy*

- 1) Define ionization energy:
- 2) Graph of ionization energy versus atomic number.



- 3) What trend do you observe in the graph?
- 4) Looking at the atomic numbers how does the trend you observe in question #3 apply the elements on the periodic table?
- 5) There are some areas on the graph where the ionization energy goes down before going back up. Looking at the atomic numbers, why do you think that this occurs?

### *Electron Affinity*

- 1) Define electron affinity:

2) Graph of electron affinity versus atomic number.



3) What trend do you observe in the graph?

4) Looking at the atomic numbers how does the trend you observe in question #3 apply the elements on the periodic table?

5) There are certain elements that have an electron affinity of zero. Based on the definition and what you know about electron configuration, why do you think this happens?

6) What's the difference between ionization energy and electron affinity? How do their graphs compare?

### *Electronegativity*

1) Define electronegativity:

2) Graph of electronegativity versus atomic number.



3) What trend do you observe in the graph?

4) Looking at the atomic numbers how does the trend you observe in question #3 apply the elements on the periodic table?

Practice Questions:

- 1) Arrange each set of atoms in order from largest to smallest:
  - (a) K, Li, Cs
  - (b) Pb, Sn, Si
  - (c) F, O, N
- 2) For each of the following sets of atoms and ions, arrange them in order of increasing size:
  - (a)  $\text{Se}^{2-}$ ,  $\text{Te}^{2-}$ , Se
  - (b)  $\text{Co}^{3+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$
  - (c) Ca,  $\text{Ti}^{4+}$ ,  $\text{Sc}^{3+}$
  - (d)  $\text{Be}^{2+}$ ,  $\text{Na}^+$ , Ne
- 3) Consider S, Cl, and K and their most common ions.
  - (a) List the atoms in order of increasing size.
  
  - (b) List the ions in order of increasing size.

- (c) Explain any differences in the orders of atomic and ionic radii.
- 4) Predict which atom of the following pairs will have the smaller first ionization energy:
- (a) Cl, Ar
  - (b) Be, Ca
  - (c) K, Co
  - (d) S, Ge
  - (e) Sn, Te
- 5) Write the equations corresponding to the following:
- (a) The first ionization of Se
  - (b) The electron affinity of  $\text{Cl}^-$
  - (c) The electron affinity of  $\text{Fe}^{2+}$
  - (d) The ionization of Ba
- 6) Select the most electronegative atom in each of the following sets:
- (a) Na, Mg, K, Ca
  - (b) P, S, As, Se
  - (c) Be, B, C, Si
  - (d) Zn, Ge, Ga, As
- 7) Select:
- (a) The most electronegative element in 6A
  - (b) The least electronegative element in the group Al, Si, P
  - (c) The most electronegative element in the group Ga, P, Cl, Na